

# UC Irvine

## UC Irvine Previously Published Works

### Title

Cell Measurement: Flow Cytometry. First Principles. Alice Longobardi Givan. Wiley-Liss, New York, 1992. xiv, 202 pp., illus. Paper, \$34.95.

### Permalink

<https://escholarship.org/uc/item/4b8293j8>

### Journal

Science, 260(5113)

### ISSN

0036-8075

### Author

Shapiro, Howard M

### Publication Date

1993-06-04

### DOI

10.1126/science.260.5113.1533-a

### Copyright Information

This work is made available under the terms of a Creative Commons Attribution License, available at <https://creativecommons.org/licenses/by/4.0/>

Peer reviewed

## Chemistry of the Cosmos

---

**Elements and the Cosmos.** MIKE G. EDMUNDS and ROBERTO TERLEVICH, Eds. Cambridge University Press, New York, 1992. xiv, 332 pp., illus. \$59.95. From a conference, Cambridge, U.K., July 1990.

---

Bernard Pagel, the honoree of these proceedings of the 31st Herstmonceux Conference, is an irrefutable argument against general policies of compulsory retirement. After reaching the statutory maximum age for a British civil servant at Royal Greenwich Observatory, where he was a recognized expert on the abundances of the elements in different kinds of stars, he became professor of astrophysics at the Nordic Institute for Theoretical Physics in Copenhagen and is now considered the foremost authority on the amount of helium left from the Big Bang. Somewhere, a farsighted institution undoubtedly awaits the Danish witching hour and further developments in Pagel's interests.

The subject of the book, nucleosynthesis and galactic chemical evolution, is a many-faceted one, requiring an understanding of nearly all of astronomy and significant chunks of chemistry and physics as well. The goal is to

measure the chemical composition of the full range of cosmic objects—stars, galaxies, quasars, and all the rest—and then to figure out how they got that way. En route, we need (i) laboratory data on atomic transition probabilities and other properties, (ii) spectroscopic data on strengths of emission and absorption lines, (iii) enough understanding of radiative transfer to turn those data into relative abundances of all the elements present, (iv) laboratory data and calculations for nuclear reaction rates and products under conditions expected in the early universe and in stars, (v) models of the structure and evolution of stars to tell us which reactions will occur and how long they will take as a function of stellar mass and composition, (vi) an assumption about conditions in the universe 10 to 20 billion years ago (generally the standard hot Big Bang), (vii) plausible scenarios describing the rate of transformation of gas into stars and the mix of stellar masses formed at each stage, and (viii) an intuitive grasp of which comparisons of observation and theory will best test whether we are approaching the right answers.

*Elements and the Cosmos* addresses many aspects of these necessary steps to understanding nucleosynthesis and chemical evolution. Some contributions are very sharply focused on C IV absorption lines in quasars, the gas in a particular spiral galaxy, or the neutron-capture cross section of krypton and zirconium. Others paint with broader brushes. Some of the latter (especially Gustafsson on stellar abundances and Reeves on cosmological nucleosynthesis) are a good starting place for a graduate student or postdoc approaching the topic, and will remain so for some time.

Conference proceedings are an easy target. Besides the unevenness of the contributions, this one has about as many type-faces as it has papers and some ugly pages, but also a useful, comprehensive index. On the positive side, ten such volumes, representing the state of the art in the subfields that most interest you, take up no more shelf space than three months' worth of an archival journal and are much more likely to contain the numbers and references that you need. If the origin and abundances of the elements is one of these subfields for you, this volume will serve the purpose very nicely until the next conference comes along. Moreover, when you reach the age at which you're asked to give historical review talks and after-dinner speeches, the old conference volumes on the bottom shelf will provide illuminating snapshots of "what we knew when."

Pagel began the last session of the conference by saying that "the best thing about a conference is not so much what you learn as what you unlearn." The subject of nucleosynthesis and chemical evolution is not now changing so fast that much unlearning

was needed at this gathering. Chances are, then, that the book will remain current long enough for you to order, receive, and read it. Meanwhile, I am very happy to have the review copy among my ten recent proceedings volumes.

**Virginia Trimble**

*Department of Physics,  
University of California,  
Irvine, CA 92717 and  
Department of Astronomy,  
University of Maryland,  
College Park, MD 20742*